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AUTHOR DeMauro, Gerald E.
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ABSTRACT

The status of New Jersey school districts' evaluation and reporting network of compensatory education programs is surveyed. The procedures involved in the analysis are explained, and the results are interpreted. The reported analyses compared actual student growth to growth that could be expected without Basic Skills Improvement (BSI) program intervention. In all cases, the program accelerated the acquisition of basic skills. Analyses evaluate scores from the Fall 1979 pretest and Spring 1980 posttest of students enrolled in BSI programs. Results show improvement in reading skills, language arts, and especially, computation skills. Of special interest is that districts of higher socioeconomic status outscored the means of the tests' standardization samples. The current data are consistent with previous years in showing large gains for elementary school students and smaller gains for high school students. (Author/GK)

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ACHIEVEMENT IN BASIC SKILLS IMPROVEMENT 1981

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ACHIEVEMENT IN

BASIC SKILLS IMPROVEMENT

1981

FRED G. BURKE

COMMISSIONER OF EDUCATION

Prepared under the direction of

GERALD E. DE MAURO, Ph. D.

Office of Evaluation
Division of Research, Planning and Evaluation
New Jersey State Department of Education
225 West State Street
Trenton, New Jersey 08625

April, 1981

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EXECUTIVE SUMMARY

Basic Skills Improvement (BSI) programs in New Jersey form a coordinated network of compensatory education programs funded through ESEA Title I, State Compensatory Education, and local efforts. The implementation of those programs is continually evaluated through local, county and state monitoring and basic skills program reviews.

Each year districts report the impact of their programs on cognitive growth as measured by achievement test scores. These scores represent pre (October) and post (April) test scores in communication (reading and language arts) and computation. For the past three years, the analysis of these data has served as part of the yearly evaluation of compensatory programs.

The reported analyses compared actual student growth to growth that could be expected without program intervention. In all cases, the program accelerated the acquisition of basic skills. Moreover, this acceleration was greater than it has been since the state began measuring the impact of these compensatory programs.

These analyses evaluate scores from the Fall 1979 prestest and Spring 1980 posttest of students enrolled in BSI programs. The results show strong improvements in these areas:

1. In reading skills, BSI students improved from an average (mean) pretest score corresponding to the 23rd percentile to a mean post-test score corresponding to the 36th percentile.

2. In language arts, BSI students improved from a mean pretest score corresponding to the 24th percentile to a mean posttest score corresponding to the 36th percentile.

3 The largest gains were in computation skills. Students improved from a mean pretest score corresponding to the 26th percentile to a mean posttest score corresponding to the 42nd percentile.

4. Districts of higher socioeconomic status actually outscored the means of the tests' standardization samples. It is as though this whole segment of the state, on the average, rose from being relatively poor in basic skills to being relatively proficient.

The data provide evidence that BSI programs have been successful. A number of factors should be considered in applying these results to program implementation:

1. The current data are generated from a sample that contains proportionally more students who have been exposed only to the Thorough and Efficient (T & E) system and no other education system. In the past, students were more the product of earlier systems.

2. The current data are consistent with previous years in showing large gains for elementary school students and much smaller gains for high school students.

3. Although there are still differences between the more and less affluent districts, this year's poorer districts are scoring in the range of the past years' richer districts.

I. INTRODUCTION

Overview

Over the past several years, a large share of state and federal resources has been targeted to improving the basic skills of various student populations. Instruction in these skill areas encompasses mathematics, reading, and language arts, and is supported by State Compensatory Education, ESEA Title I, and local funds. These sources impact every district in New Jersey, and the consequent demands for accountability are great.

The State Department of Education has responded to these demands by providing technical assistance to help districts implement various evaluation models. These models serve the dual purpose of providing districts with feedback on how well their students are achieving in these programs, and of giving the state information on how well students are performing across the state.

Each year, districts return test scores of program participants to the state. The types of scores that are reported (Normal Curve Equivalents, described later in the text) enable researchers to use the October (pretest) scores and the test norms to project how students would have scored on the posttest if there were no program. Actual posttest scores are then compared to these projections, and the differences are attributed to program effects. Moreover, analyses of these effects are made for various subject areas, grades, funding sources, and socioeconomic levels.

The current report surveys the status of the districts' evaluation and reporting network, explains the procedures involved in the analyses, and presents and interprets the results. Some of the procedures may be unfamiliar to the reader, however, and an explanation of terms follows to make the report more comprehensible.

Explanation of Terms

As in the past few years, the report uses three technical terms which may not be familiar to the lay reader. These are "District Factor Grouping (DFG)," "Normal Curve Equivalents (NCEs)" and "Analysis of Variance (ANOVA)."

DFG: Ten District Factor Groupings range from A through J. An eleventh grouping, Z, is given to those districts that cannot be placed in any other category (districts without students, for example). The DFGs describe the socioeconomic factors.

Type A districts have the lowest socioeconomic status, while type J districts have the highest. For the purposes of statistical analyses, the districts were grouped as types A; B, C or D; E, F or G; and H, I or J. This grouping is justified by the distribution of districts and scores.

NCEs: Normal Curve Equivalents (NCEs) are types of test scores that range from 1 (low) to 99 (high). Like percentiles, they describe the relative scoring of students or districts. Thus, a student who scores a NCE of 99 has scored among the highest segment of the population comprising of test norms. A student scoring a NCE of 1 has scored among the lowest scorers comprising the test norms.

Unlike percentiles, NCEs have the characteristic of being equal intervals. This means that the distance between any two contiguous NCEs is the same, regardless of which two are chosen. The distance from the 49th to 50th NCE is theoretically equivalent to the distance between the first and second. This property enables meaningful addition, subtraction and averaging of NCEs, processes which cannot be performed with percentiles or grade equivalents.

ANOVA: The statistical technique used to assess differences in groups of scores is Analysis of Variance (ANOVA). Simply stated, ANOVA considers whether the means among various groups of scores (pretest vs. posttest, for example) are large enough to be attributable to something other than chance. In the current analysis, the mean of the actual posttest is compared to the mean of what would be predicted on the posttest if students had not been enrolled in the program. The difference between the two is called significant only if such a difference would arise by chance, alone, 5% or less of the time.

Model A1: The model employed is a Title I Model A1. Each student who takes an achievement test in the Fall (pretest) is given an NCE score based on performance relative to the test's Fall norms. These are averaged for the district and constitute the no-program expectation, or what performance could be expected had there not been a program.

Without intervention, it is assumed that students would remain the same on the test norms in the Spring. That is, students would improve on the test, but students comprising the norms also would have improved during the school year and the district's relative performance would be unchanged. The difference between the mean pretest NCE and mean posttest NCE would be 0 even though the students actually scored better, in an absolute sense, on the test. If students scored no better in an absolute sense, their position relative to the advancing norm group would drop and the change in NCEs would be negative.

The statistical analysis assesses whether growth in NCEs is so large as to exceed any expectation based on chance alone. Analyses were made for all basic skills improvement programs, funded by ESEA Title I and by State Compensatory Education.

Interpretation of the results greatly depends on how representative the sample used for analysis is of the state as a whole. Recent improvements in districts' capacities to report data accurately, have enabled this year's results to accurately portray the state.

Improvements in the Reporting Network

Over the past few years, a number of events have greatly increased the amount of usable data for judging the effectiveness of the Basic Skills Improvement programs. These were:

a. Adoption of the RMC (Title I) models for all Basic Skills Improvement programs;

b. The standardization of reporting processes and scoring metrics statewide;

c. The report forms which enable analysis of data for groups broken out by grade, socioeconomic status and funding sources, as well as by project area (Reading, Computation or Language Arts); and,

d. The efforts of the Office of Evaluation, the Bureau of Basic Skills Improvement and the (Region II) Title I Technical Assistance Center in training districts on the use and application of the reporting models. As a result, the quality of the data has vastly improved.

This last point cannot be overemphasized. More districts are testing with the proper instruments on the norm dates. The technical expertise developed in the districts also enables them to solve the routine problems that may have prevented optimum use of their reports two years ago.

The current analysis makes use of all data provided by districts who pretested in the Fall 1979 and posttested in the Spring 1980 at the times which allowed proper data aggregation. Basically, these comprise districts using Model A1.*

Data are reported by district, by school and by grade.** Table I demonstrates the impact of the improvement over the past few years in aggregatable data provided by the districts.

TABLE 1

NUMBER OF GRADE MEANS USED

	Number Used	Percent Growth From Pervious Year
Reading		
1977-78	592	—
1978-79	1,385	+134%
1979-80	1,900	+ 37%
Language Arts		
1977-78	—	—
1978-79	—	—
1979-80	218	—
Computation		
1977-78	294	—
1978-79	1,691	+475%
1979-80	1,628	– 4%

*Although results from grade 1 are also reported, districts are not responsible to submit these data in a Model A1 format. Therefore, data from this grade must be considered as coming from a voluntary sample.

**Data reported in this study are limited to those districts that administered tests within acceptable time limits of each other and of the test norm dates.

II. RESULTS - READING SKILLS

Technical analyses, including Analyses of Variance summary tables, are found in Appendices A, B, and C. The results show that significant progress beyond expectation was made by students is all basic skills improvement programs. A summary of results follows.

All Basic Skills Improvement Programs

a. The actual posttest mean of 42.3 NCEs significantly exceeded the no-program expectation of 34.6. Students improved from the 23rd national percentile to the 36th.

b. Scoring was also reliably related to district socioeconomic status, as measured by DFG, and grade level. Subsequent analyses showed that poorer districts (DFG: A) scored worse than the richer districts (DFG: H, I or J).

c. There were significant interactions involving all combinations of variables:

   1. Achievement by grade was related to socioeconomic status; and

   2. Pretest to posttest gains were related to grade level, socioeconomic status and the interaction of these variables.

Title I Programs

a. Title I programs scored significantly higher on the posttest (43.3 NCEs) than could have been expected without the program (34.7 NCEs). In terms of percentiles, students grew from the 23rd to the 38th percentile.

b. Scoring gains were reliably related to district socioeconomic status and grade level. The higher status districts outscored the lower, while lower grades outscored upper grades.

c. A grade by pre-to posttest interaction revealed that lower grades made the largest gains.

State Compensatory Education Programs

a. Compensatory Education programs scored significantly higher on the posttest (41.9 NCEs) than could have been expected without the program (34.4 NCEs). In percentiles, students grew from the 23rd to the 35th percentile.

b. District socioeconomic status and grade level again were significant predictors of scoring. More affluent districts outscored poorer and lower grades outscored higher grades.

c. There was a significant interaction between grade and socioeconomic status. For example, at Grades 4 - 6, lower status districts (mean = 36.8) actually outscored districts of the next higher status (mean = 35.6), though not significantly. There were also two interactions involving pre-to posttest growth and grade level (Grades 1 - 3 rose significantly) and socioeconomic status. These latter comparisons were without relevance to the study (for example, the posttest of higher status districts was significantly higher than the pretest of lower status districts). There was also a significant interaction of pre-to posttest growth, socioeconomic status and grade level. The higher grades and lower status districts were much weaker on the pretest than were the lower grades and higher status districts on pre- or posttest.

III. RESULTS - COMPUTATION SKILLS

Using the same analytic techniques, the test scores in Computation Skills (see Appendices A, B and C) revealed growth patterns similar to those above. Significant progress was again made beyond expectation. The significant results are summarized below.

All Basic Skills Improvement Programs

a. The actual posttest mean of 45.5 NCEs significantly exceeded the no-program expectation of 36.2. This represents growth from the 26th to the 42nd national percentile - a dramatic leap.

b. Scoring was again reliably predicted by district socioeconomic status and grade level. Moreover, the familiar pattern of lower grades and higher status districts achieving higher scores held true.

c. Interactions of every combination of variables were significant. In the first, scores in the second lowest socioeconomic status districts did not drop as much in higher grades as did scores of the three other district types. There were also significant differences in the elementary grades (1 - 6) from pre- to posttest. Pre- to posttest differences were also very large in the higher status districts (E, F, G, H, I and J). Finally, districts of every status scored well on the posttest in the elementary grades, but the means for districts of DFG: H, I or J actually surpassed the theoretical norming mean of 50.0 NCEs (Means for grades 1, 2 and 3 = 54.9 and for 4, 5 and 6 - 51.0). To gauge the success of this achievement, these means represent the 55th and 51st percentiles, respectively.

Title I Programs

a. Title I programs scored significantly higher on the posttest (46.9 NCEs) than could have been expected without the program (35.9 NCEs). In terms of percentiles, students improved from the 25th to the 44th percentile.

b. Scoring held true to the pattern described earlier. Higher status districts outscored lower status districts, while lower grades outscored upper grades.

c. There were a number of significant interactions:

1. The pre- to posttest differences in grades 1 - 4 were larger than in other grades;

2. While socioeconomic status interacted with pre-to posttest growth significant comparisons were of no interest to the study (the pretest of poorer districts were lower than the posttest of more affluent districts); and

3. Finally, grade level interacted with both socioeconomic status and time of test. In grades 1 - 6, the posttest of the highest status districts actually surpassed the mean of the test standardization samples (means of 55.6 and 54.1 respectively, representing the 61st and 58th percentiles, respectively).

State Compensatory Education Programs

a. Compensatory Education programs scored significantly higher on the posttest (45.7 NCEs) than could have been expected without the program (36.2 NCEs). In percentiles, students grew from the 26th to the 42nd percentile - 16 points.

b. District socioeconomic status and grade level were significantly related to scoring. Higher status districts outscored lower status districts while the elementary grades outscored the higher grades.

c. All combinations of variables were significant.

   1. The pattern found for all programs was replicated: the decline of scores over grades was not as great for districts in the second lowest socioeconomic status (DFG: B, C and D).

   2. The largest rises from pre- to posttest were found in grades 1 - 6.

   3. The largest gain by socioeconomic status was recorded by the second most affluent group of districts (DFG: E, F and G).

   4. The lower grades did exceedingly well on the posttest. The primary grades of the highest status districts (55.4 NCEs) again exceeded the mean of standardization samples, but even the least affluent primary grades scored a mean of 46.0 NCEs (a percentile score of 43).

IV. RESULTS - LANGUAGE ARTS

All Basic Skills Improvement Programs

a. The actual posttest mean, 42.4 NCEs, significantly exceeded the no-program expectation of 35.2. Students improved from the 24th percentile to the 36th percentile.

b. Scoring was also reliably related to district socioeconomic status as measured by DFG and grade level. The lower grades and higher status districts outscored higher grades and poorer districts, respectively.

c. The only significant interaction involved pre- to posttest growth and grade level. Subsequent analyses proved this interaction to be unimportant to the study questions. The posttest of lower grades was better than the pretest of higher grades.

Title I Program

a. Title I programs scored significantly higher on the posttest (46.1 NCEs) than could have been expected without the program (36.7 NCEs). In terms of percentiles, students grew from 26th to the 43rd percentile.

b. Scoring was reliably related to district socioeconomic status and grade level. While the numbers of means used in the language arts analyses were low, some exceptions to the usual patterns of scoring were evident. Students continued to score better in the lower grades. However, the second lowest socioeconomic status districts actually scored best while the second highest socioeconomic status districts actually scored poorest.

c. There were two significant interactions of variables. In the first, the scores of the various grades were dependent upon the socioeconomic status of the reporting districts. While there were too few district means of varying socioeconomic status contributing language arts data for any given grade block, the trend showed higher scoring in the lower grades and higher socioeconomic groups. The second interaction between the pre- to posttest growth and grade level revealed significant differences between groups that were not of interest to the questions of the study. For example, the lower grades on the posttest outscored the higher grades on the pretest.

State Compensatory Education Programs

a. The actual posttest mean of 41.8 NCEs significantly exceeded the no-program expectation of 35.3. This represented student growth from the 24th to the 35th percentile.

b. Scoring was again reliably attributable to grade level and socioeconomic status. Again, lower grades outscored higher and more affluent districts outscored poorer districts.

c. The interactions of the variables revealed the following:

1. While for most districts, the scores declined over grades, for districts in the second lowest status group (DFG: B, C and D), the scores went up from the junior high school to the high school grades.

2. The largest gains from pretest to posttest were scored in the lower grades (Grades 1, 2 and 3 gained 11 NCE points, while Grades 10, 11 and 12 gained 4 NCE points).

3. While there was an interaction of pre- to posttest growth and socioeconomic status, the greatest differences were again of little interest to the study.

V. DISCUSSION

Choosing a Standard of Success

There is no standard to assess whether the amount of gain for any subject areas, grade or socio-economic level is large or small. The analyses used here really address the question of consistency or how reliable are the gains. To further examine the question of program success, we will define two relative standards: (a) historical success; and (b) final posttest scores.

Historical success across funding areas (Figure 6). In 1977-78 the reading pretest mean was 30.0 and the posttest mean was 38.6. The following year, the pretest mean was 32.5 and the posttest mean was 39.5. Thus while the gain was 6.6 points the first year, it was a full 7.0 points the second year. This year in reading skills, students scored a mean of 34.6 on the pretest and 42.3 on the posttest. This gain of 7.7 points is the largest yet.

In 1977-78, the computation pretest mean was 34.0 and the posttest mean was 40.4, a gain of 6.4 points. Last year, the pretest mean was 31.9 and the posttest was 41.2, a gain of 9.3 points. This year in computation skills, students scored a mean of 36.2 on the pretest and 45.5 on the post-test, a mean gain of 9.3 points. This equals last year's growth.

Posttest scores across funding areas (Figure 7). The ultimate goal of compensatory education programs is mainstreaming. Theoretically, the higher the posttest score, the better equipped the students should be to re-enter the regular instructional programs.

In reading skills, the mean posttest was a 38.6 in the lowest socioeconomic status districts. This equalled the mean for all districts in 1977-78 (the highest posttest mean this year was 45.8 for the highest status districts). In computation skills, the poorest districts scored a mean of 41.1 on the posttest. This actually surpassed the state mean in 1977-78 (the highest mean this year was 48.4 for the highest status districts).

While there were significant gains in scores in 1977-78, the data suggest that students defined as needing compensatory basic skills instruction are being prepared much better now for regular instructional programs.

VI. CONCLUSION

Scores of children participating in New Jersey's Basic Skills Improvement programs showed extraordinary improvements in reading, computation and language arts skills. Comparison with data from previous years and with expected achievement levels, without programs, all gave evidence that locally-funded, state funded Compensatory Education and federal Title I programs were successful.

Moreover, readers can have great confidence in these findings. The technical assistance network, which operates to improve district evaluation processes, has enabled the state to expand its data sources and include many more districts in the current analysis than has ever been possible.

It is evident from the overall data that New Jersey's Basic Skills Improvement Programs are working. Educators across the state can see, based on the data, that remedial and intervention programs in the basic skills are having impact to improve the performance of students who do not meet the state's minimum proficiency standards. It is evident that funds which have been provided for compensatory programs are triggering remediation efforts which show success and improvement for New Jersey students.

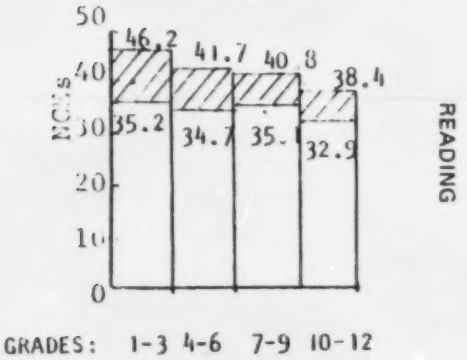
FIGURE 1

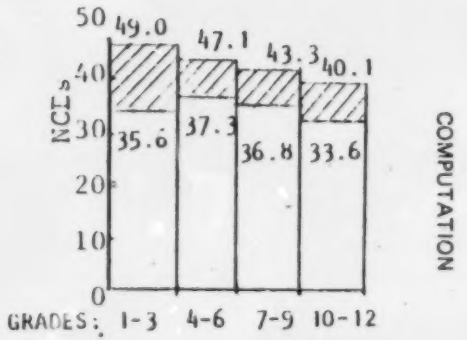
ACHIEVEMENT GAINS BY GRADE BLOCKS

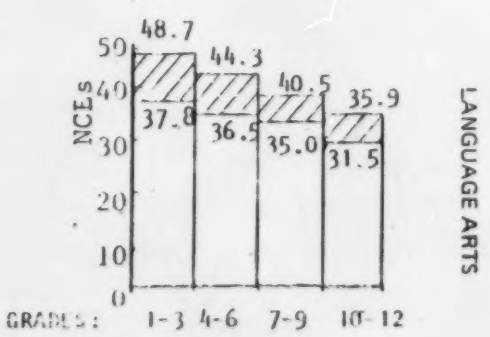
PRE

POST

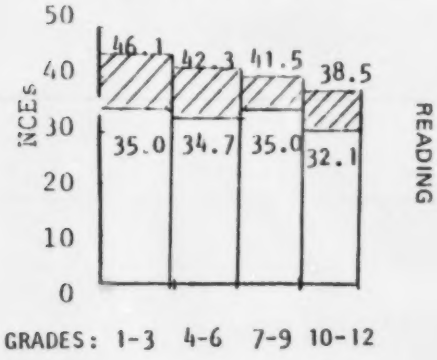
ALL BSI PROGRAMS

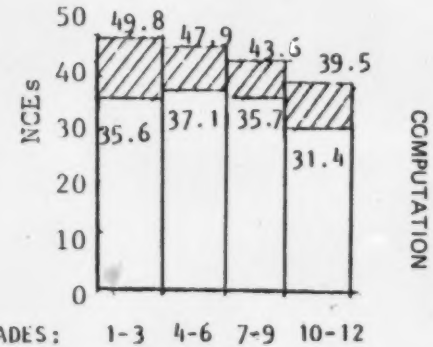


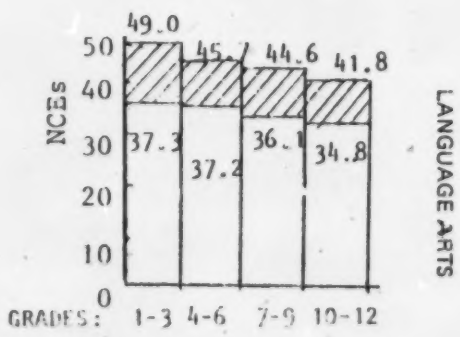




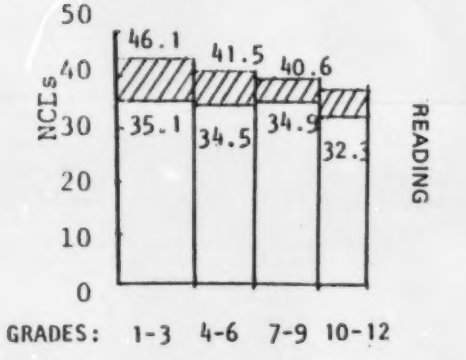
TITLE I PROGRAMS

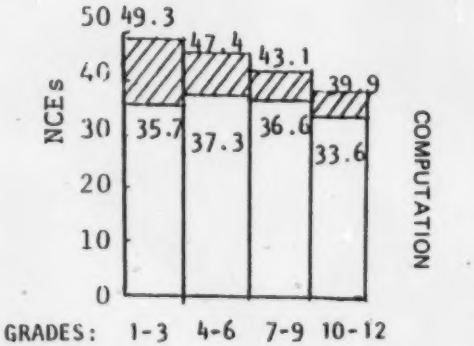






STATE COMP. ED. PROGRAMS





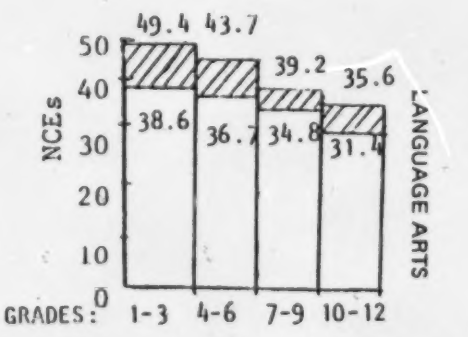


FIGURE 2

READING GAINS BY DFG BLOCKS

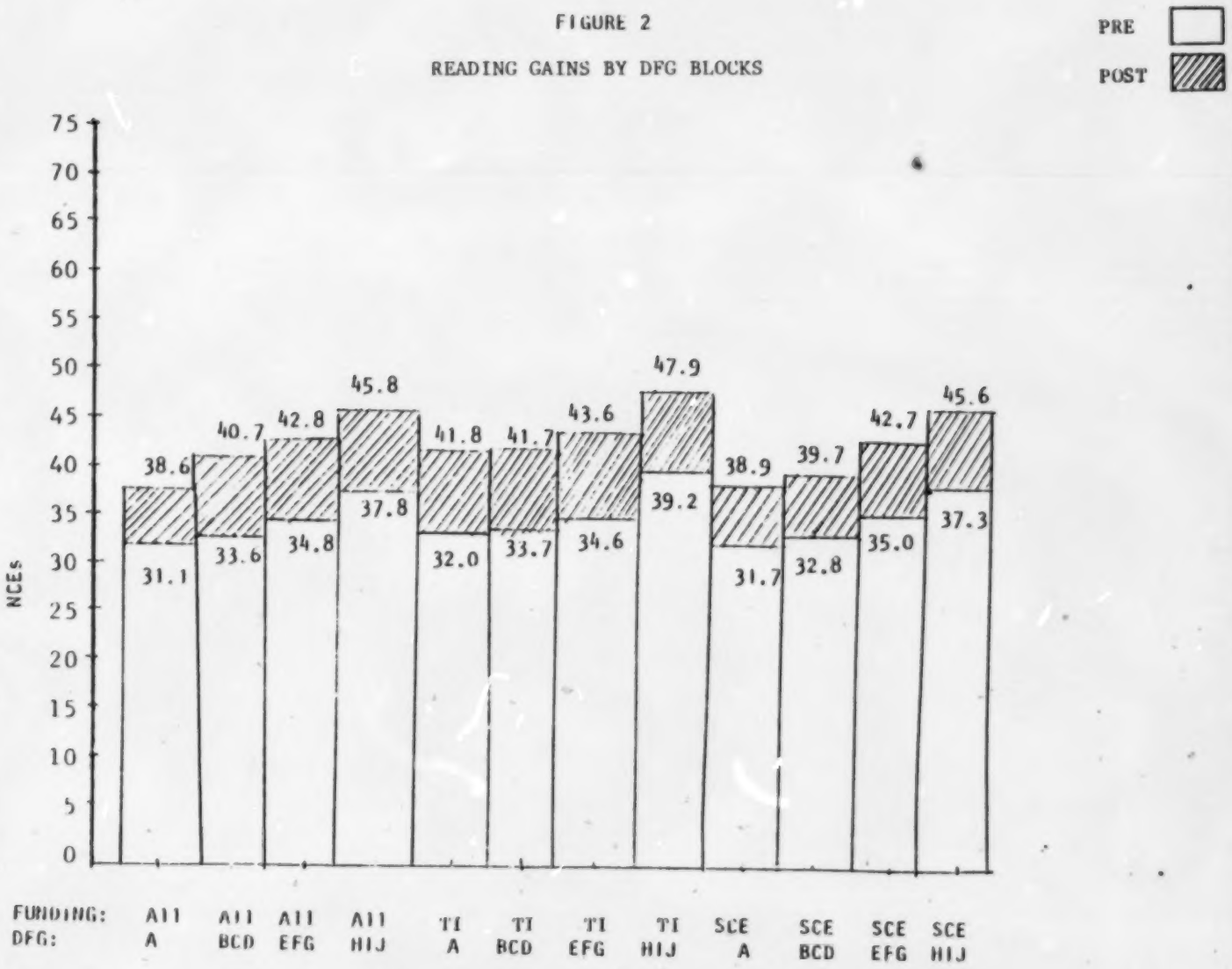


FIGURE 3

COMPUTATION GAINS BY DFG BLOCKS

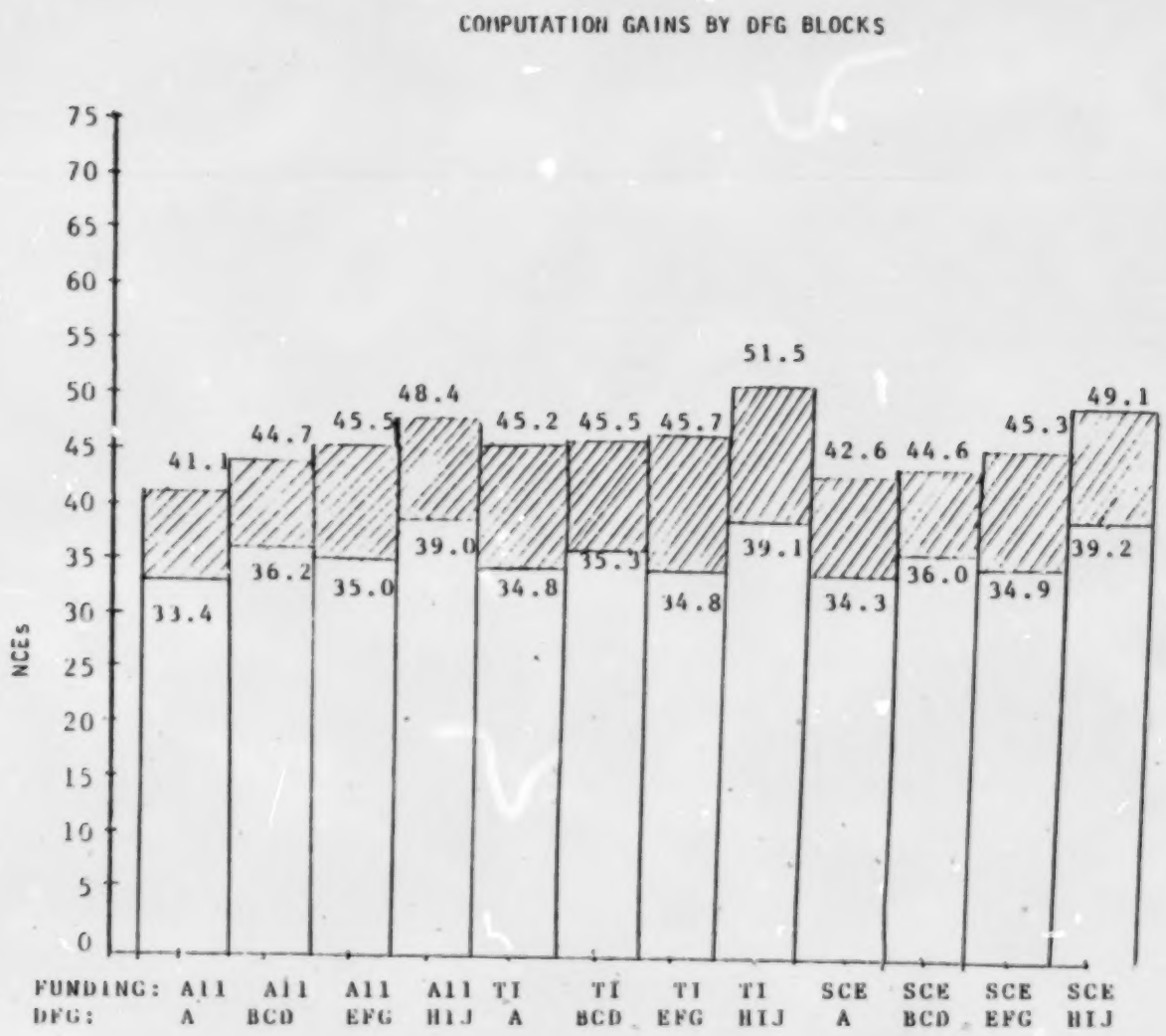


FIGURE 4

LANGUAGE ARTS GAINS BY DFG BLOCKS

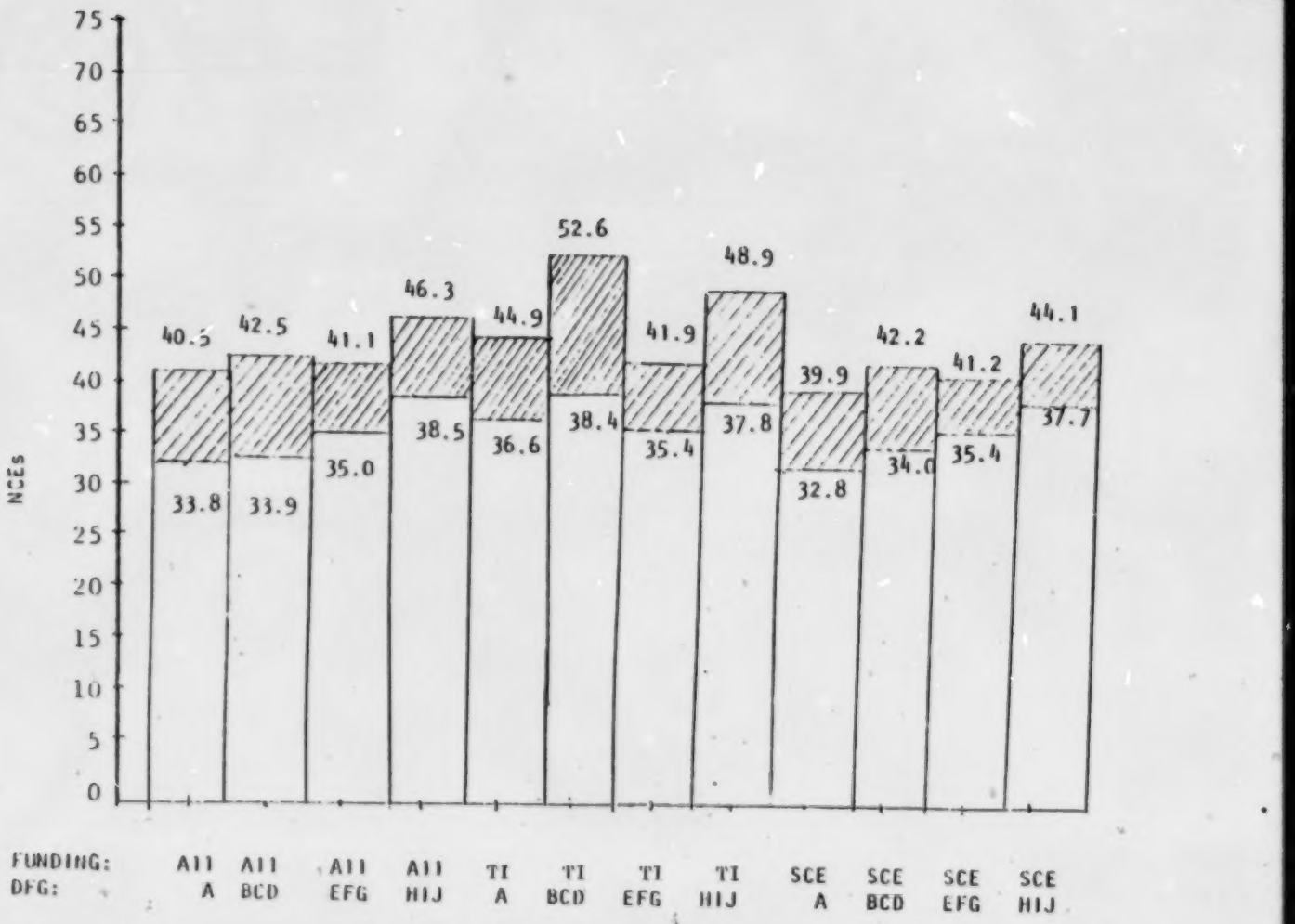


FIGURE 5

Amount of Growth by Grade Level

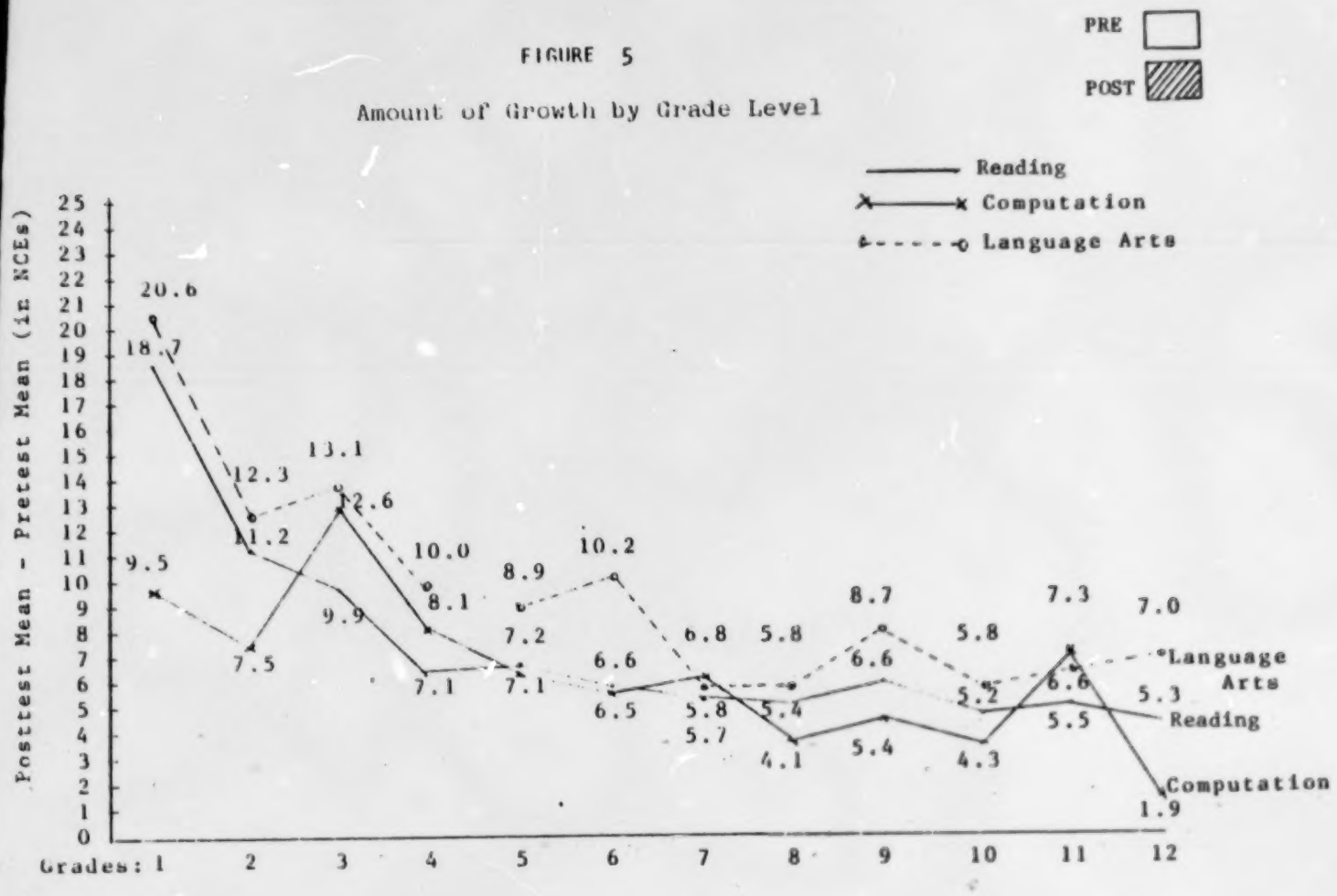


FIGURE 6

GROWTH IN ACHIEVEMENT BY YEARS
(ALL BSI STUDENTS)

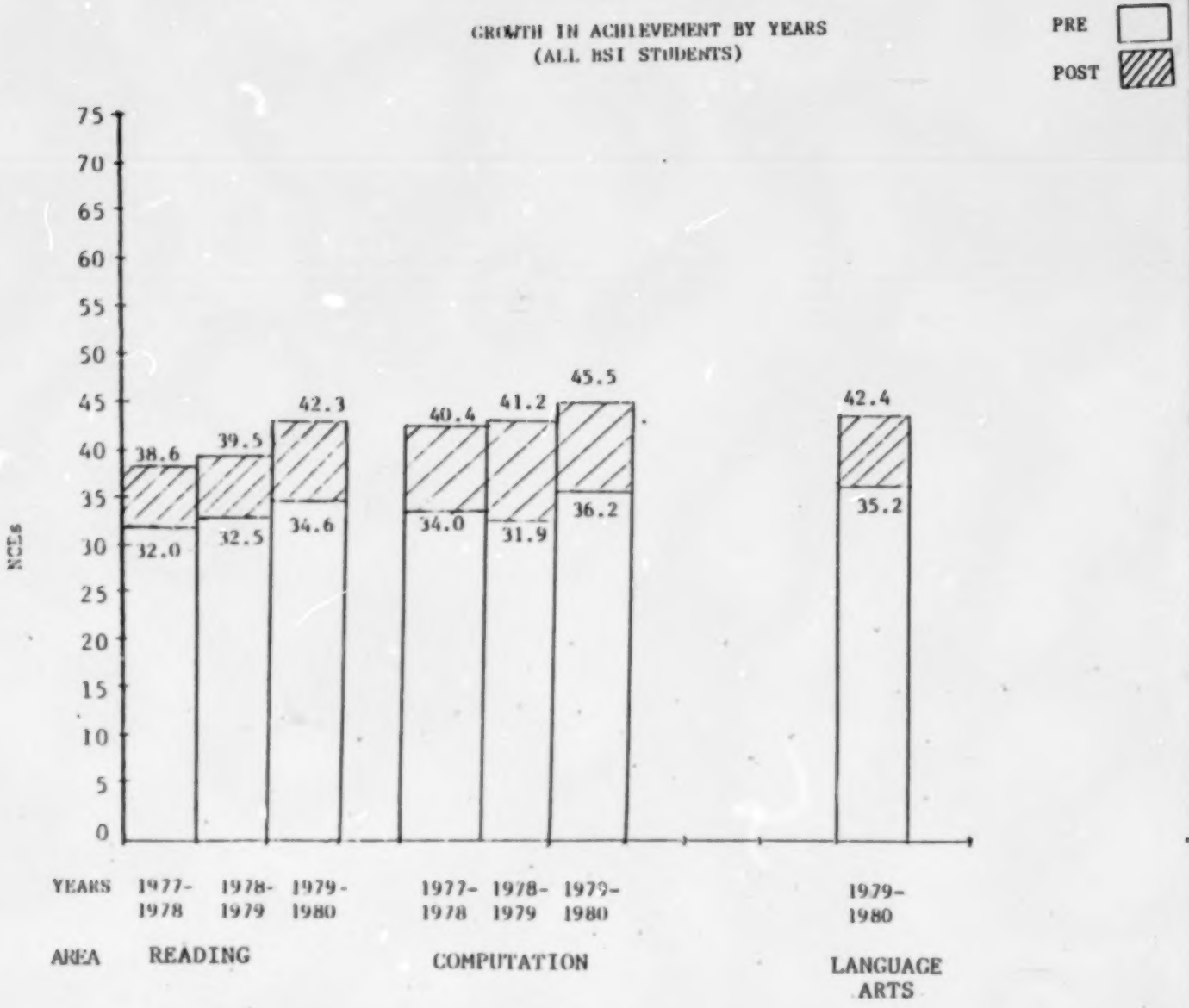
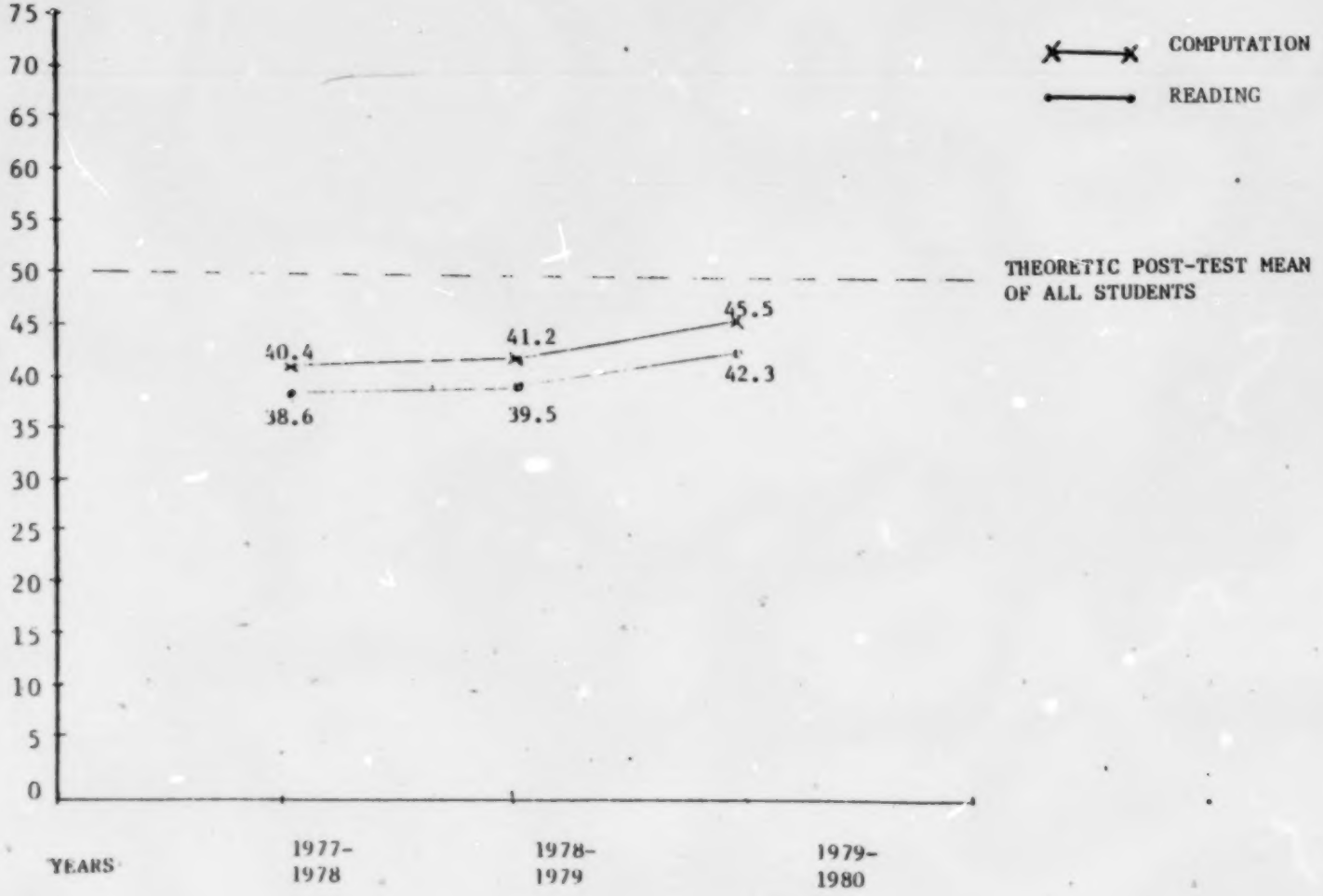


FIGURE 7

POST-TEST SCORES OVER THE PAST THREE YEARS

(ALL BSI STUDENTS)



APPENDIX A

ALL STUDENTS

APPENDIX A
ANALYSIS OF VARIANCE SUMMARY TABLES

	SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F-RATIO
READING SKILLS				
Grade	248,922.90	3	82,974.30	18.520***
DFG	1,233,952.04	3	411,317.35	91.806***
Grade x DFG	116,123.41	9	12,902.60	2.880*
Error	8,440,903.53	1,884	4,480.31	
Total Between Ss.	10,039,901.88	1,899		
Pre-post	1,060,599.56	1	1,060,599.56	2,048.687***
Pre-post x Grade	126,896.83	3	42,298.94	81.706***
Pre-post x DFG	30,788.15	3	10,266.03	19.830***
Pre-post x Grade x DFG	9,829.35	9	1,092.15	2.110*
Error	975,341.50	1,884	517.70	
Total Within Ss.	2,203,455.39	1,900		
Total	12,243,357.27	3,799		
COMPUTATION SKILLS				
Grade	373,686.60	3	124,562.20	29.926***
DFG	626,497.85	3	208,832.62	50.171***
Grade x DFG	179,749.78	9	19,972.20	4.798***
Error	6,709,761.21	1,612	4,162.38	58.348***
Total Between Ss.	7,889,695.44	1,627		
Pre-post	1,559,957.29	1	1,559,957.29	1,786.314***
Pre-post x Grade	277,648.71	3	92,549.57	105.979***
Pre-post x DFG	152,864.11	3	50,954.70	58.349***
Pre-post x Grade x DFG	62,140.46	9	6,904.50	7.906***
Error	1,407,732.11	1,612	873.28	
Total Within Ss.	3,460,342.68	1,628		
Total	11,350,038.12	3,255		
LANGUAGE ARTS				
Grade	68,803.90	3	22,934.63	12.215***
DFG	45,126.81	3	15,042.27	8.012***
Grade x DFG	10,159.78	9	1,128.86	0.601
Error	379,255.98	202	1,877.50	
Total Between Ss.	503,346.47	217		
Pre-post	27,796.62	1	27,796.62	74.757***
Pre-post x Grade	7,526.41	3	2,508.80	6.747***
Pre-post x DFG	1,233.41	3	411.14	1.106
Pre-post x Grade x DFG	5,328.85	9	592.09	1.592
Error	75,109.39	202	371.83	
Total Within Ss.	116,994.68	218		
Total	620,341.15	435		

*Exceeds the .05 level of significance.
**Exceeds the .01 level of significance.
***Exceeds the .001 level of significance.

APPENDIX B

TITLE I

APPENDIX A
ANALYSIS OF VARIANCE SUMMARY TABLES

	SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F-RATIO
READING SKILLS				
Grade	127,853.52	3	42,617.84	12.156***
DFG	227,512.01	3	75,837.34	21.631***
Grade x DFG	8,276.26	9	919.59	0.262
Error	3,519,954.87	1004	3,505.93	
Total Between Ss.	3,883.596.67	1019		
Pre-post	357,929.87	1	357,929.87	583.542***
Pre-post x Grade	36,178.61	3	12,059.54	19.662***
Pre-post x DFG	4,617.65	3	1,539.22	2.509
Pre-post x Grade x DFG	6,699.03	9	744.34	1.214
Error	615,828.70	1004	613.38	
Total Within Ss.	1,021,253.86	1020		
Total	4,904,850.52	2039		
COMPUTATION SKILLS				
Grade	160,138.50	3	53,379.50	19.851***
DFG	100,063.90	3	33,354.64	12.404***
Grade x DFG	38,728.74	9	4,303.19	1.600
Error	1,919,916.58	714	2,688.96	
Total Between Ss.	2,218,847.72	729		
Pre-post	413,329.72	1	413,329.72	518.861***
Pre-post x Grade	61,412.54	3	20,470.85	25.698**
Pre-post x DFG	8,761.98	3	2,920.66	3.666*
Pre-post x Grade x DFG	17,481.82	9	1,942.42	2.438**
Error	568.779.29	714	796.61	
Total Within Ss.	1,069.765.34	730		
Total	3,288,613.06	1459		
LANGUAGE ARTS				
Grade	16,060.26	3	5,353.42	7.610***
DFG	11,188.60	3	3,729.53	5.302**
Grade x DFG	8,728.99	5	1,745.80	2.482*
Error	65,422.07	93	703.46	
Total Between Ss.	101,399.92	104		
Pre-post	31,739.06	1	31,739.06	107.187***
Pre-post x Grade	2,954.11	3	984.70	3.326**
Pre-post x DFG	1,586.38	3	528.79	1.786
Pre-post x Grade x DFG	1,679.89	5	335.98	1.135
Error	27,538.17	93	296.11	
Total Within Ss.	65,497.61	105		
Total	166,897.51	209		

*Exceeds the .05 level of significance.
**Exceeds the .01 level of significance.
***Exceeds the .001 level of significance.

APPENDIX C
COMPENSATORY EDUCATION

APPENDIX A
ANALYSIS OF VARIANCE SUMMARY TABLES

	SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F-RATIO
READING SKILLS				
Grade	222,778.02	3	74,259.34	16.680***
DFG	1,053,153.53	3	351,051.18	78.852***
Grade x DFG	138,488.33	9	15,387.59	3.456***
Error	6,873,872.68	1,544	4,451.99	
Total Between Ss.	8,288,292.57	1,559		
Pre-post	937,636.14	1	937,636.14	1,965.871***
Pre-post x Grade	110,839.28	3	36,946.43	77.463***
Pre-post x DFG	32,253.62	3	10,751.21	22.541***
Pre-post x Grade x DFG	8,882.20	9	986.91	2.069*
Error	736,422.01	1,544	476.96	
Total Within Ss.	1,826,033.26	1,560		
Total	10,114,325.82	3,119		
COMPUTATION SKILLS				
Grade	403,777.50	3	134,592.50	34.919***
DFG	536,426.13	3	178,808.71	46.391***
Grade x DFG	143,762.97	9	15,973.66	4.144***
Error	5,615,867.22	1,457	3,854.40	
Total Between Ss.	6,699,833.82	1,472		
Pre-post	1,425,470.38	1	1,425,470.38	1,569.998***
Pre-post x Grade	254,020.79	3	84,073.60	93.259***
Pre-post x DFG	136,288.39	3	45,429.46	50.036***
Pre-post x Grade x DFG	58,281.39	9	6,475.71	7.132***
Error	1,322,874.82	1,457	907.94	
Total Within Ss.	3,196,935.77	1,473		
Total	9,896,769.59	2,945		
LANGUAGE ARTS				
Grade	45,879.95	3	15,293.32	9.56***
DFG	61,143.24	3	20,381.08	12.75***
Grade x DFG	35,686.51	9	3,965.17	2.48*
Error	243,066.66	152	1,599.12	
Total Between Ss.	385,776.36	167		
Pre-post	18,509.15	1	18,509.15	52.232***
Pre-post x Grade	6,590.38	3	2,196.79	6.199***
Pre-post x DFG	3,811.12	3	1,270.37	3.585*
Pre-post x Grade x DFG	2,785.74	9	309.53	0.873
Error	53,863.27	152	354.36	
Total Within Ss.	85,559.66	168		
Total	471,336.02	335		

*Exceeds the .05 level of significance.
**Exceeds the .01 level of significance.
***Exceeds the .001 level of significance.

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